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Perspectives on Computing and Organizational Rationalization.*

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Abstract

It is widely believed that the introduction of computing into organizations contributes to more rationalized decisionmaking and policymaking. Until recently, little empirical work has been done on this topic. This paper defines three perspectives, termed the Determinist, Contingency, and Voluntarist viewpoints, which appear in contemporary analyses of the rationalizing effects of computing. Three particular analyses, each of which employs one of these perspectives, are examined and the explanatory power of each viewpoint is compared. We find that the Deterministic position, which holds that computing's contribution to rationalization is determined by technical effectiveness and processing capacity, doesn't fully explain the dynamics of computing and organizational rationalization. The effects of organizational structure, organizational environment, bureaucratic politics and social interaction often undermine the rationalizing potential of computing.

Keywords: Computing in Organizations, Organizational Rationalization, Social Analysis of Computing.

Introduction

It has often been suggested that computing promotes the rationalization of organizational behavior, decisionmaking, and structure. Early writers like Greenberger [8] and Simon [21] suggested that computing would aid the centralization of decisionmaking, increase division of labor, and increase specialization and routinization of functions within the organization. Until the seventies, however, there weren't many careful empirical studies of the effects of computing on organizational rationalization. Fortunately, in the past decade more attention has been given to empirical assessments of computing impacts [13, 14]. Better understandings of the links between automation and bureaucratic rationalization are emerging. But these are turning out to be quite complex, rather than simple relations.

The rationalizing effects of computing are still not well understood, and analyses are written from numerous perspectives. Early, simple claims that computing and rationalization go hand in hand find less support as we expand our scope of analysis. The best contemporary analyses have shifted focus from the potential technical benefits of computing under ideal or implicitly assumed social conditions. Instead, they take an empirically derived view which situates computing in an evolving social context, treats a wide array of organizational actors as potential stakeholders in computing developments, and examines the role of social arrangements (like relations of power in an organization or the desire for

control over computing) in tempering any rationalizing effects of computing. Such studies find that the degree of rationalization fostered by computing often depends on significant factors external to the technology itself. The difficulty of researching these factors makes it hard to give definite answers to questions of computing and rationalization. This paper will examine several viewpoints which have emerged in research on this issue.

Organizational Rationality

"Rationality" is a dimension of organizations that isn't often clearly defined by those investigating the impacts of computing. The assertion that an organization is "rationalized" is often taken to mean that it is more highly bureaucratized (in a Weberian sense) than some "less rational" organization. The expressed differences between more and less rationalized organizations sometimes seem to be analogous to the differences between the "mechanistic" and "organic" types of organization depicted in Burns and Stalker's study of electronics firms [3]. On the one hand, "organic" organizations are evolving, laterally structured, improvised, and may contain widely distributed pools of expertise and control. Other, more "mechanistic" organizations are built around specialized, differentiated procedures, standard functions, formalized communications, and hierarchical structure. Such formal features help to regulate the behavior of participants, aiming to make them more effective, efficient, predictable, and timely in achieving some clearly defined goals

of the organization.

Burns and Stalker rightly point out that either the mechanistic or the organic form may be equally "rational," depending upon particular environmental contingencies faced by the organization. Despite this, and in accordance with tradition, reference to an organization or procedure as more "rational" and "rationalized" will be used here to indicate that it is a more formal, mechanistic, or bureaucratized type of organization.

Our discussion in this paper will be limited to studies of the use of computing in decisionmaking and policymaking, since most research which examines the connection between computing and rationalization has focused on these areas. Simon has presented an exemplary model of rationalized decisionmaking [21]. In his view, rational decisionmaking comprises three stages: intelligence gathering, design of alternatives, and choice. In contrast, less rational decisions might be based on intuition, beliefs, or choosing first option to present itself. A rationalized policymaking process includes gathering information on policy alternatives, constructing "policy arguments", balancing and choosing among alternatives, and monitoring the implementation of policy [5].

There is some danger in viewing such idealized concepts as simple "logos" of rationality. The fact that a firm has implemented specialized procedures or standard rules may make it appear more rational. But a closer look into the processes

of organizational life may reveal that people have come to rely upon other, less rationalized, ways of managing their work. Rational procedures may be routinely circumvented by actors with special problems or "hidden agendas." For example, while formal procedures have been implemented in many organizations for reporting problems with computing services, we find that users who are hard-pressed and in need of timely responses often phone a "special contact" for answers and help. Calling upon such informal contacts may subvert formal arrangements for prioritizing service, but it helps particular users get work done and maintain relationships of power and resource control. In similar ways, formal communication and reporting structures may evolve into more ad hoc channels as personnel or organizational units are faced with volatile work demands or changing power balances.

In other contexts, actual working and decisionmaking arrangements are sometimes obscured by a more visible but only pro forma system which seems highly rationalized. A "sham" system may exist to divert attention from actual behavior, perhaps to protect the decision-making autonomy of a group in the organization.

Sapolsky describes such a system in his discussion of the use of a computerized PERT system during the development of the Polaris missile [20]. The PERT system's existence contributed to an image of the Navy's Special Projects Office (SPO) as a highly rationalized, accountable, and well managed group. Auditors felt little need for probes of the SPO and Polaris

development because they saw PERT as such an excellent system for managerial control. But those actually engaged in designing, building and managing the Polaris system denied ever using PERT [20:123-4]. Sapolsky reports:

> "The fact that not one of the participant groups claimed to have benefitted directly from the installation of PERT did not prevent unanimous agreement that PERT was of great benefit to the program as a whole... 'The real thing to be done was to build a fence to keep the rest of the Navy off of us. We discovered that PERT charts and the rest of the gibberish could do this. It showed them we were top managers.' 'The people in DOD and Congress had to be impressed. PERT made us OK with the people who had the money. We did it in spades - computers, the whole bit.'" [20:124]

Since deviations from "rationality" may occur in parallel with the continued use of formalized procedures (as was the case with PERT in the SPO setting), we have the problem of distinguishing between theoretical images or simple symbols of rationalization and empirically verified rationalization.

The Deterministic Perspective

Some analyses of computing and bureaucratic rationalization have suggested that computing is by nature a rationalizing force in organizations since it enhances the processing of information. They present the view that the rationalizing tendency of computing is only dependent upon the technical capabilities of computers to supply organized information for analysis, decisionmaking, budget tracking, recordkeeping, and the like. Along with rationalization, these

analyses usually assert that computing promotes centralization of decisionmaking and control, because of the information consolidating capacity of computers. From this perspective, the introduction of computing leads to increased efficiency for the organization, and enhanced control. Whisler, for example, conducted a study of 19 American insurance firms, in the early sixties [22]. Based on his data, he reported that "the computer tends to rationalize and quantify decisionmaking" [22:70]. He found that across the board, quantification of decision criteria was perceived as a primary rationalizing effect of computing by his respondents.

Analyses written from a deterministic viewpoint typically employ the organization as a unit of analysis. They rarely contain evidence from careful empirical examinations of interactions between organizational subunits or individuals. In addition, Deterministic analyses typically are not concerned with effects of the external environment on the organization, or with variations in forms of production (e.g. small batch vs. continuous process production).

Other analyses of the deterministic tradition, both speculative and empirical, can be found in papers by Danziger [5], Simon [21], Kanter [10], and much of the Management Information Systems literature.

The Contingency Perspective

The Deterministic perspective was one of the earliest views of computing. Analysts had little empirical research and

scanty theoretical underpinnings to guide them. Since computing itself was just emerging, subtle effects were sometimes swamped by the sheer magnitude of technical change.

More recently, some other analysts have come to believe that the degree and type of rationalizing effects depends upon such variables as organizational environment, the technology employed, and organizational structure. They hold a "Contingency" perspective on the issue of whether computing rationalizes organizations. Studies from this perspective have roots in the work of contingency theorists of organizations [7, 17, 19]. Contingency theorists believe that there is no single "best way" to structure an organization. Instead, they argue that variations in demands on organizations and in organizational goals may require different (and changing) structures.

For example, in our own research, we have seen some evidence that Material Requirements Planning (MRP) systems may enhance scheduling decisions in manufacturing organizations having large order backlogs, firm master production schedules, and moderately long time horizons in which to plan production. On the other hand, manufacturers with very short production times, highly volatile markets, or process → oriented manufacturing technologies may find MRP completely unsuitable, or even hampering. In other recent work on computing in organizations we found project managers in a large land development firm neglecting to use available computer→based financial analyses which had been performed for them. They

were making decisions in an investment environment where almost any projects would be financially viable, and simply didn't need to consider automated analyses that had been run. Most problems with developing projects centered around interactions with local governments, not financial feasibility. A contingency analysis would focus on environmental factors such as manufacturing techniques, scheduling lead times or land development climate in explaining these impacts of decisionmaking information.

The Voluntarist Perspective

Still more recently, some analysts have suggested that still greater analytic scope is necessary to explain the many of the workings of computing in organizations. They have adopted a "Voluntarist" perspective. In Voluntarist analyses, computing is a flexible social and political resource, as well as a potential organizational tool. Moreover, its use is embedded in the ongoing bureaucratic political processes of an organization. As such, computing doesn't necessarily tend to rationalize the operations of an organization, though it may be used to do so. Increased rationalization is the product of active choices made by participants, and is not a priori determined by technical features and organizational structures. In Voluntarist analyses, the degree of rationalization depends on and is shaped by the existing social and political arrangements in an organization, beliefs about the effective uses for computing, and especially the interests and incentives of participants. In effect, social and political arrangements

tend to dominate the role of computing in organizational life for voluntarist analysts. Thus, it becomes necessary to investigate the social and political arrangements in an organization in order to assess the ways in which computing has contributed to rationalization.

The Voluntarist position focuses on organizational sub-units, individual actors, power balances, and socio-political meanings as units of analysis. Examples of Voluntarist analyses can be found in the work of Laudon [15, 16], Danziger, [5], Pettigrew [18], and Kling [11, 12].

Empirical Studies

In recent years there have been increasing numbers of empirical studies addressing the effects of computing in organizations. Few of these have directly addressed the issue of the rationalizing effects of computerization, but many have a position on this issue. Whisler's study of computing in the life insurance industry mentioned earlier [22] is an analysis in the Deterministic mold. In it, Whisler suggests that organizational decisionmaking is more highly rationalized because it becomes more "quantified." Critical decisionmaking criteria are less based on intuition and more based on numerical data such as actuarial analyses or simulation models.

However, one problem with Whisler's analysis is his simple link between the presence of quantified information and greater decisionmaking rationality. First, it is important that relevant information be quantified. Next, it may be difficult

to expose the assumptions lying behind choices of data and analytical models, and to assure that data is accurate and timely. Such complications may arise because issues beyond the simple technical effectiveness of information systems can and do affect patterns of information use, system involvement, and data quality. Other empirical studies, for example, have shown how organizational politics and obscure assumptions may undermine modeling efforts [2, 9], and how easily computerized data becomes inaccurate, out of date, or unreflective of conditions it supposedly represents [2, 4, 6, 16]. These factors can decrease the utility and rationality of automated systems.

Bjorn - Anderson's group studied computing and organizational rationalization in three systems: a Danish production planning system, and marketing and hospital patient information systems in England [1]. His group used measures of optimization, standardization and formalization as indicators of organizational rationalization. They found that reported increases in the standardization of procedures differed significantly between organizations, with the hospital setting showing the smallest increase. Bjorn - Anderson explains that "there would have been more reference to increased standardization had the system been used more widely" [1:6].* Similarly, reported changes in the formalization of communication were different in the three organizations, with

* It is interesting to note that the Bjorn - Anderson study does not present a thorough analysis of the reasons <u>why</u> the hospital system was used less widely.

production planning showing most change, followed by marketing. The hospital system again shows the least change, which he attributes also to lack of use. Bjorn - Anderson points out that changes in communication patterns with these systems partly depended upon the types of communication channels affected. Some respondents reported increased contact initiated by specific computerized reports. Others said that their computer system handled communication itself, thus reducing contact.

Bjorn - Anderson's analysis exemplifies the Contingency viewpoint on rationalization via computing. In his analysis, bureaucratic rationalization is contingent on the degree of system use, as well as factors like the type of communication contacts engendered by computing. In addition, longer term computing use may depend upon external factors. The marketing system he studied eventually fell into disuse, because of changes in the distribution environment. He reports that "changes in the market tended to render the estimates progressively less realistic and managers tended to make their assessments on other criteria" [1:14]. A simple, deterministic analysis would either have failed to predict such deterioration of use and the attendant "de-rationalization" of marketing analyses, or would have explained it as a function of deficiencies in the information processing capacity of the computing system, rather than as a result of external environmental changes. (Bjorn - Anderson presents no data on why the system was not adapted to reflect the new market

conditions.)

Danziger presents a fascinating discussion of the effects of computing on power, rationality, and control in an empirical study of automated information systems (AIS) in local governments [5]. Danziger reports that over one third of all governments surveyed had automated simple recordkeeping and calculation tasks (like payroll calculations and check printing), to achieve efficiencies and staff reductions in routinized information processing tasks. His studies, part of the Urban Information Systems (URBIS) project at the University of California, Irvine, indicate that there is expanding use of computing in generating information about policy alternatives and monitoring policy implementation. Left at this, Danziger's analysis would be cast in the deterministic mold. But Danziger extends this view by observing the difference between making information available and actually putting it to use. He explains that since automated information can be a powerful resource, actors tend to use it primarily when they feel they have control over it. Such selective use of automated information means that "there is minimal use of AIS in most aspects of problem solving (that is, identifying problems, specifying alternatives, or policy evaluation)." The problems of control over data can arise regardless of the technical features of the AIS or the accuracy and timeliness of the data it provides. The parties who make use of information have bases of political power which they wish to protect and enhance. Thus, issues of access to and control over

information can have strong impacts on the rationalizing effects of computing. This is a position explainable from a Voluntarist viewpoint, emphasizing bureaucratic politics, but not from a Deterministic position, which would focus on the rational technical benefits of AIS.

Conclusions

There are three points to be made in conclusion. First, it is important to stress the value of empirical studies for revealing subtle effects of computing in organizations. More importantly, empirical studies serve to ground theoretical development in real events, rather than speculations. Empirical studies can only enhance the coordination of theory with existing practices.

Second, it is unwise to rely on simple logos or symbols of rationality, for example the existence of formal rules, for verification that a process has been rationalized. Close scrutiny of informal, "backstage" behavior may reveal a different world.

The third key point of this paper has been the need to consider many factors in organizational life besides simple issues of technical capability when assessing the rationalizing effects of automated information systems. Deterministic analysis focuses on technical capability of computing and simple symbols of rationality. Expanding the analytical scope to a contingency analysis adds dimensions of external environment, task environment and data quality to an assessment

of the rationalizing effects of computing. Enlarging the view still further, a Voluntarist perspective considers the intentions and interests of participants, as well as social and political arrangements in organizations, and their effects on computing use.

Simple Deterministic speculations about computing and increasing rationalization have been provocative. But broader empirical investigations tend to indicate that many expectations for the rationalizing effects of computing have failed to materialize.

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